

AZ-104T00A

Module 04:

Virtual Networking



Module Overview

- Lesson 01: Virtual Networks
- Lesson 02: IP Addressing
- Lesson 03: Network Security Groups
- Lesson 04: Azure Firewall
- Lesson 05: Azure DNS
- Lesson 06: Module 04 Lab and Review

Lesson 01: Virtual Networks



Virtual Networks Overview

- Azure Networking Components
- Virtual Networks
- Subnets
- Implementing Virtual Networks
- Demonstration – Creating Virtual Networks

Azure Networking Components

- Adopting cloud solutions can save time and simplify operations
- Azure requires the same types of networking functionality as on-premises infrastructure
- Azure networking offers a wide range of services and products



Virtual Network

Microsoft

Create a logically isolated section in Microsoft Azure and securely connect it outward.



Load Balancer

Microsoft

A load balancer that distributes incoming traffic among backend virtual machine instances.



Application Gateway

Microsoft

Scalable layer-7 load balancer offering various traffic routing rules and SSL termination for backend



Traffic Manager profile

Microsoft

Create a Microsoft Azure Traffic Manager Profile that allows you to control the distribution of user



Virtual network gateway

Microsoft

The VPN device in your Azure virtual network and used with site-to-site and VNet-to-VNet VPN



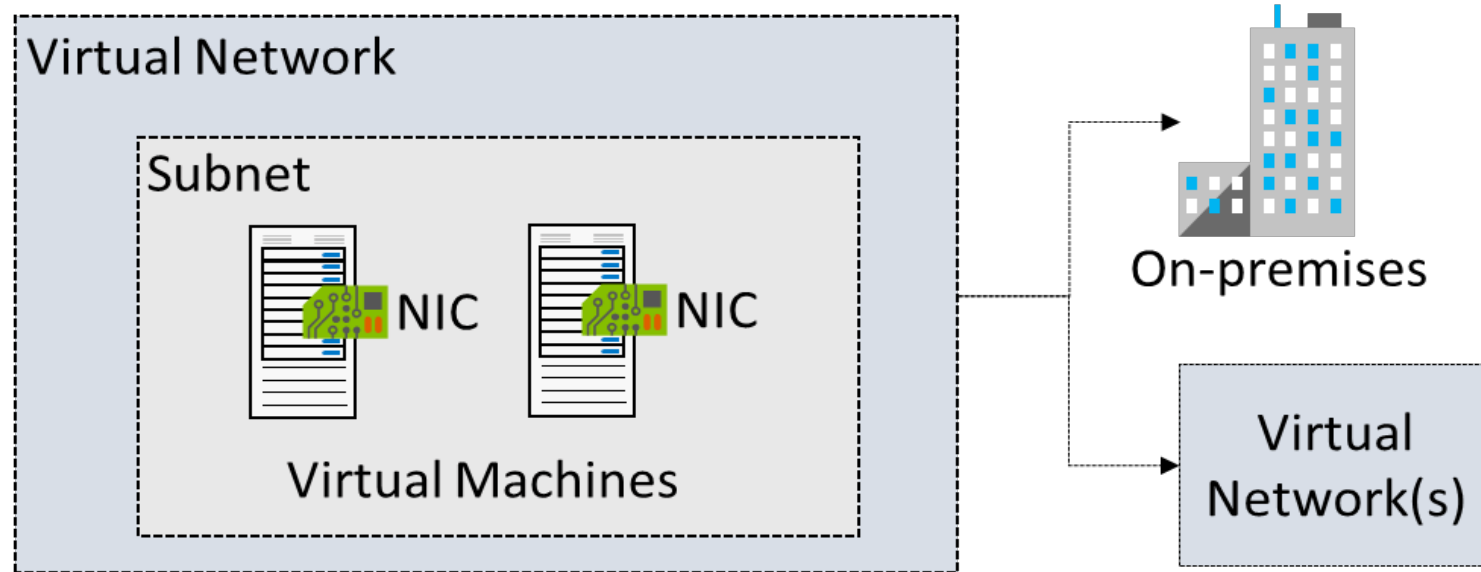
Virtual WAN

Microsoft

Azure Virtual WAN is a networking service that provides optimized and automated branch-to-branch



Virtual Networks



- Logical representation of your own network
- Create a dedicated private cloud-only virtual network
- Securely extend your datacenter with virtual networks
- Enable hybrid cloud scenarios

Subnets

+ Subnet + Gateway subnet Refresh							
Search subnets							
Name	↑↓	Address range	↑↓	IPv4 available addresses	↑↓	Delegated to	↑↓ Security group
subnet0		10.1.0.0/24		251		-	nsg0
subnet1		10.1.1.0/24		251		-	-
subnet2		10.1.2.0/24		251		-	nsg2
GatewaySubnet		10.1.255.0/24		251		-	-

- A virtual network can be segmented into one or more subnets
- Subnets provide logical divisions within your network
- Subnets can help improve security, increase performance, and make it easier to manage the network
- Each subnet must have a unique address range - cannot overlap with other subnets in the virtual network in the subscription

Implementing Virtual Networks

- Create new virtual networks at any time
- Add virtual networks when you create a virtual machine
- Need to define the address space, and at least one subnet
- Be careful with overlapping address spaces

Create virtual network

Basics IP Addresses Security Tags Review + create

Project details

Subscription * ⓘ Visual Studio Enterprise ▼

Resource group * ⓘ Lab04 ▼
[Create new](#)

Instance details

Name * VNet2 ✓

Region * (US) East US 2 ▼

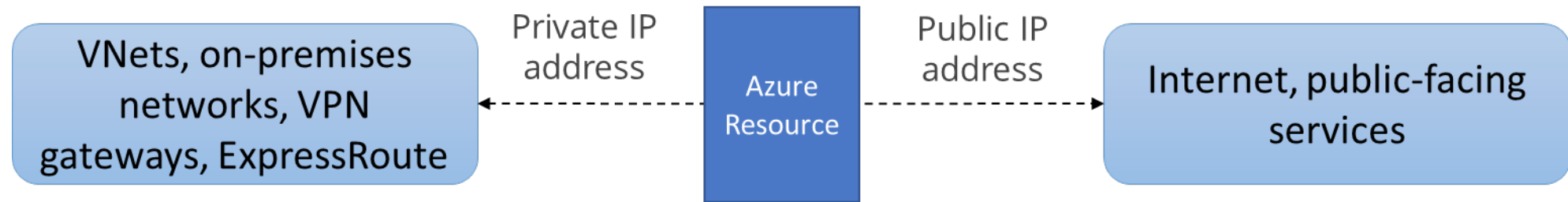
Lesson 02: IP Addressing



IP Addressing Overview

- IP Addressing
- Creating IP Addresses
- Public IP Addresses
- Private IP Addresses

IP Addressing



- **Private IP addresses** are used within an Azure virtual network (VNet), and your on-premises network, when you use a VPN gateway or ExpressRoute circuit to extend your network to Azure
- **Public IP addresses** is used for communication with the Internet, including Azure public-facing services

Creating Public IP Addresses

- Available in IPv4 or IPv6 or both
- Basic vs Standard SKU
- Available in Dynamic, Static or both (depending on SKU)
 - Zone redundant
 - Not mixable or immutable
- Range of contiguous addresses available as a prefix

Create public IP address

IP Version * ⓘ

☒ IPv4 ☐ IPv6 ☐ Both

SKU * ⓘ

☒ Basic ☐ Standard

IPv4 IP Address Configuration

Name *

IP address assignment *

☒ Dynamic ☐ Static

Public IP Addresses

Public IP addresses	IP address association	Dynamic	Static
Virtual Machine	NIC	Yes	Yes
Load Balancer	Front-end configuration	Yes	Yes
VPN Gateway	Gateway IP configuration	Yes	Yes*
Application Gateway	Front-end configuration	Yes	Yes*

- A public IP address resource can be associated with virtual machine network interfaces, internet-facing load balancers, VPN gateways, and application gateways.

* Static IP addresses only available on certain SKUs.

Private IP Addresses

Private IP Addresses	IP address association	Dynamic	Static
Virtual Machine	NIC	Yes	Yes
Internal Load Balancer	Front-end configuration	Yes	Yes
Application Gateway	Front-end configuration	Yes	Yes

- **Dynamic (default).** Azure assigns the next available unassigned or unreserved IP address in the subnet's address range
- **Static.** You select and assign any unassigned or unreserved IP address in the subnet's address range

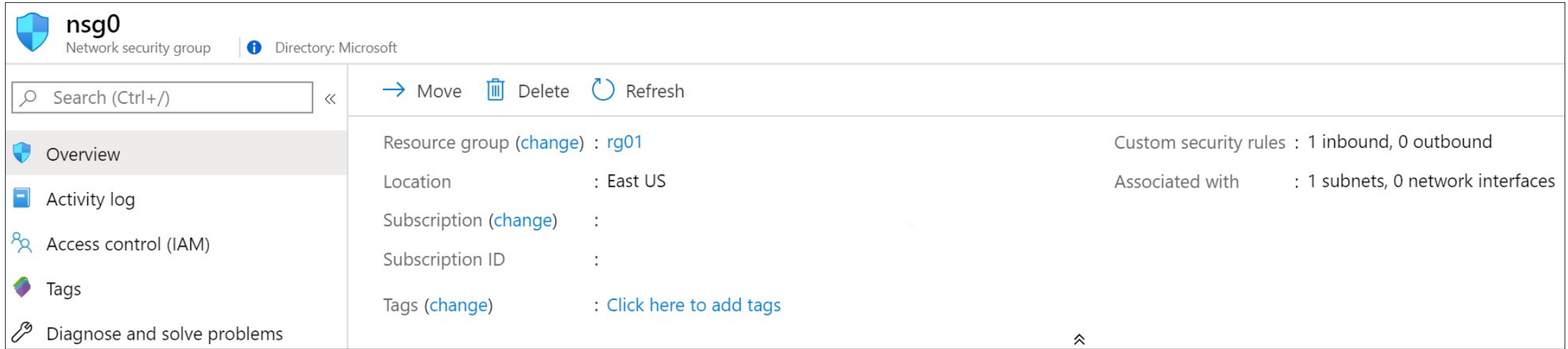
Lesson 03: Network Security Groups



Network Security Groups Overview

- Network Security Groups
- NSG Rules
- Creating NSG Rules
- Application Security Groups
- Demonstration - NSGs

Network Security Groups



The screenshot displays the Azure portal interface for a Network Security Group (nsg0). The top header shows the shield icon, the name 'nsg0', and the description 'Network security group'. Below this, a search bar and navigation links for 'Move', 'Delete', and 'Refresh' are visible. The left sidebar contains a list of navigation options: Overview (selected), Activity log, Access control (IAM), Tags, and Diagnose and solve problems. The main content area shows the following details:

- Resource group (change) : rg01
- Location : East US
- Subscription (change) :
- Subscription ID :
- Tags (change) : [Click here to add tags](#)
- Custom security rules : 1 inbound, 0 outbound
- Associated with : 1 subnets, 0 network interfaces

- Limit network traffic to resources in a virtual network
- Contains a list of security rules that allow or deny inbound or outbound network traffic
- Can be associated to a subnet or a network interface

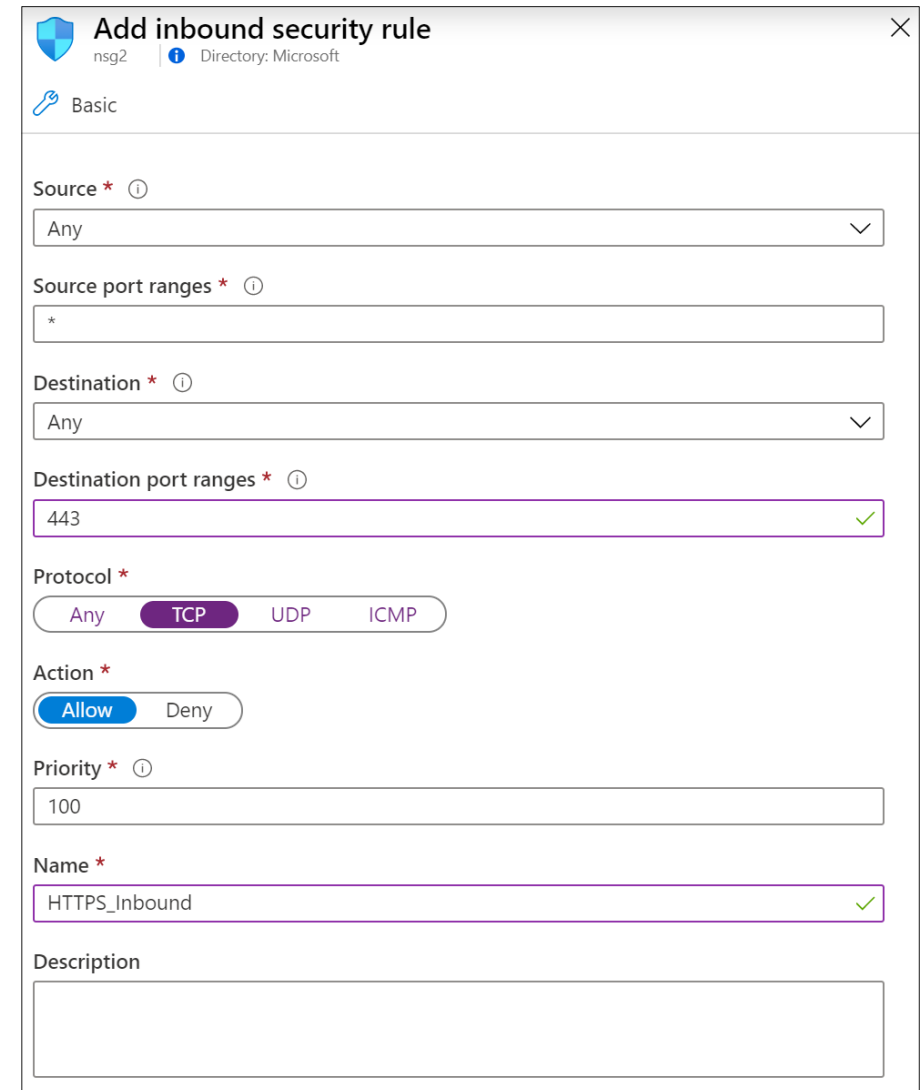
NSG Rules

Inbound security rules						
Priority	Name	Port	Protocol	Source	Destination	Action
100	 RDP_Inbound	3389	Any	Any	Any	 Allow
65000	AllowVnetInBound	Any	Any	VirtualNetwork	VirtualNetwork	 Allow
65001	AllowAzureLoadBalancerInBound	Any	Any	AzureLoadBalancer	Any	 Allow
65500	DenyAllInBound	Any	Any	Any	Any	 Deny
Outbound security rules						
Priority	Name	Port	Protocol	Source	Destination	Action
65000	AllowVnetOutBound	Any	Any	VirtualNetwork	VirtualNetwork	 Allow
65001	AllowInternetOutBound	Any	Any	Any	Internet	 Allow
65500	DenyAllOutBound	Any	Any	Any	Any	 Deny

- Security rules in NSGs enable you to filter network traffic that can flow in and out of virtual network subnets and network interfaces.
- There are default security rules. You cannot delete the default rules, but you can add other rules with a higher priority.

Creating NSG Rules

- Select from a large variety of services
- **Service** - The destination protocol and port range for this rule
- **Port ranges** – Single port or multiple ports
- **Priority** - The lower the number, the higher the priority



Add inbound security rule ✕

nsg2 Directory: Microsoft

Basic

Source * ⓘ

Any

Source port ranges * ⓘ

*

Destination * ⓘ

Any

Destination port ranges * ⓘ

443 ✓

Protocol *

Any TCP UDP ICMP

Action *

Allow Deny

Priority * ⓘ

100

Name *

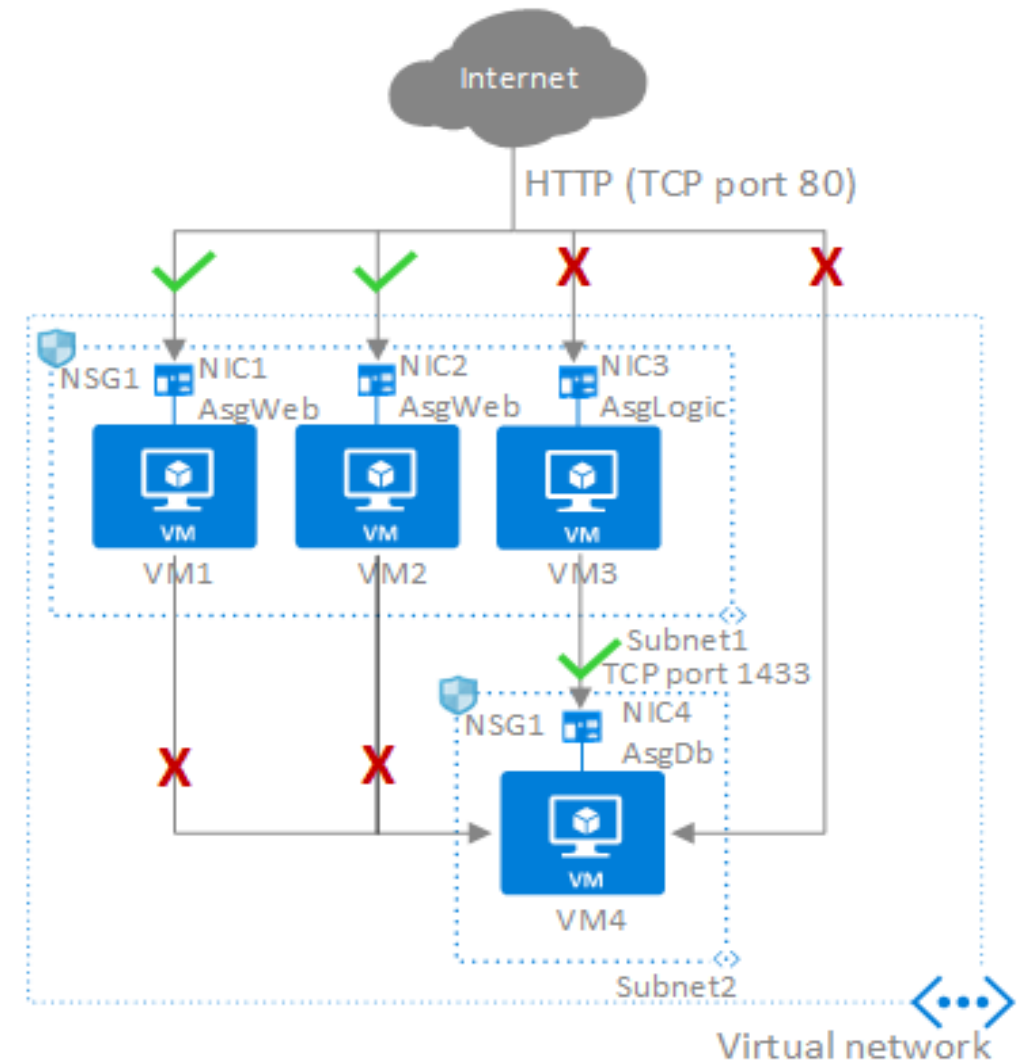
HTTPS_Inbound ✓

Description

Application Security Groups

Provides for the grouping of servers with similar port filtering requirements, and group together servers with similar functions, such as web servers.

- Allows you to reuse your security policy at scale without manual maintenance of explicit IP addresses.
- Handles the complexity of explicit IP addresses and multiple rule sets, allowing you to focus on your business logic.



Lesson 04: Azure Firewall

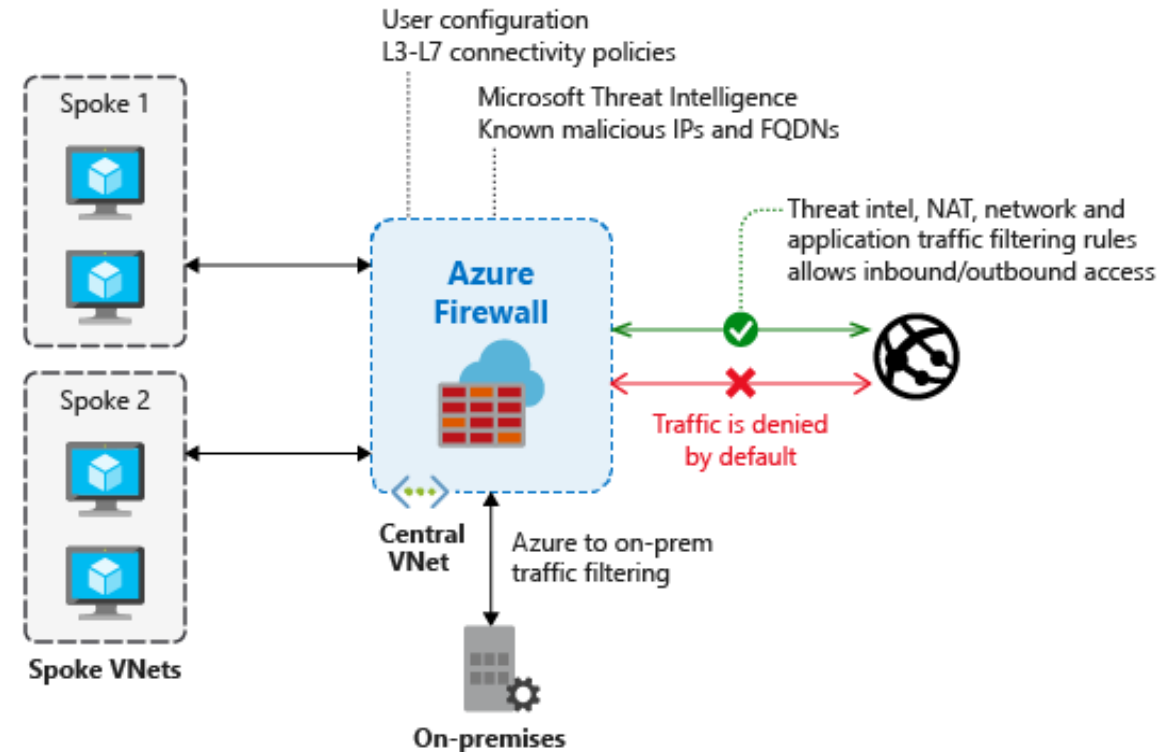


Azure Firewall Overview

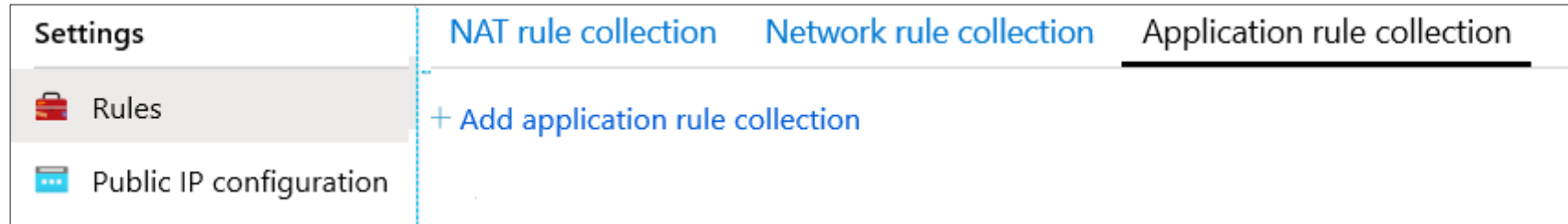
- Azure Firewall
- Firewall Rules

Azure Firewall

- Stateful firewall as a service
- Built-in high availability with unrestricted cloud scalability
- Create, enforce, and log application and network connectivity policies
- Threat intelligence-based filtering
- Fully integrated with Azure Monitor for logging and analytics
- Support for hybrid connectivity through deployment behind VPN and ExpressRoute Gateways



Firewall Rules



- **NAT rules.** Configure DNAT rules to allow incoming connections
- **Network rules.** Configure rules that contain source addresses, protocols, destination ports, and destination addresses
- **Application rules.** Configure fully qualified domain names (FQDNs) that can be accessed from a subnet

Lesson 05: Azure DNS

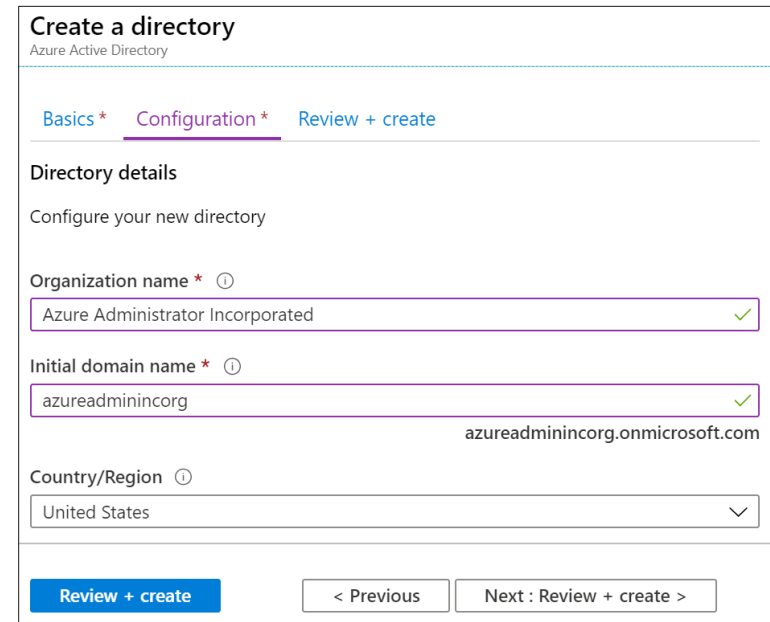


Azure DNS Overview

- Domains and Custom Domains
- Verifying Custom Domain Names
- Azure DNS Zones
- DNS Delegation
- DNS Record Sets
- DNS for Private Domains
- Private Zones Scenarios
- Demonstration – DNS Name Resolution

Domains and Custom Domains

- When you create an Azure subscription an Azure AD domain is created for you
- The domain has initial domain name in the form *domainname.onmicrosoft.com*
- You can customize/change the name
- After the custom name is added it must be verified (next topic)



Create a directory
Azure Active Directory

Basics * Configuration * Review + create

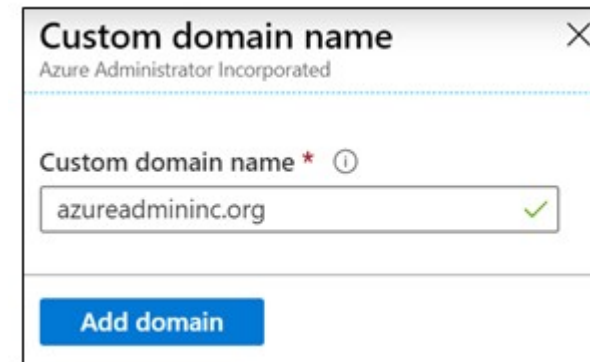
Directory details
Configure your new directory

Organization name * ⓘ
Azure Administrator Incorporated ✓

Initial domain name * ⓘ
azureadminincorg ✓
azureadminincorg.onmicrosoft.com

Country/Region ⓘ
United States ▼

Review + create < Previous Next : Review + create >



Custom domain name ✕
Azure Administrator Incorporated

Custom domain name * ⓘ
azureadmininc.org ✓

Add domain

Verify the Custom Domain Name

- Verification demonstrates ownership of the domain name
- Add a DNS record (MX or TXT) that is provided by Azure into your company's DNS zone
- Azure will query the DNS domain for the presence of the record
- This could take several minutes or several hours

azureadmininc.org
Custom domain name

 Delete |  Got feedback?

 To use azureadmininc.org with your Azure AD, create a new TXT record with your domain name registrar using the info below.

Record type

☒ TXT ☐ MX

Alias or host name

@ 

Destination or points to address

MS=ms79094380 

TTL

3600 

[Share these settings via email](#)

Verification will not succeed until you have configured your domain with your registrar as described above.

Azure DNS Zones

- A DNS zone hosts the DNS records for a domain
- The name of the zone must be unique within the resource group
- Where multiple zones share the same name, each instance is assigned different name server addresses
- Only one set of addresses can be configured with the domain name registrar

Create DNS zone

Basics Tags Review + create

A DNS zone is used to host the DNS records for a particular domain. For example, the domain 'contoso.com' may contain a number of DNS records such as 'mail.contoso.com' (for a mail server) and 'www.contoso.com' (for a web site). Azure DNS allows you to host your DNS zone and manage your DNS records, and provides name servers that will respond to DNS queries from end users with the DNS records that you create. [Learn more.](#)

Project details

Subscription *MSDN Platforms Subscription

Resource group *rg-dns
[Create new](#)

Instance details

Name *azureadmininc.org

Resource group location ⓘEast US

Review + create

Previous

Next : Tags >

[Download a template for automation](#)

DNS Delegation

- When delegating a domain to Azure DNS, you must use the name server names provided by Azure DNS – use all four
- Once the DNS zone is created, update the parent registrar
- For child zones, register the NS records in the parent domain

 **azureadmininc.org**
DNS zone

[+ Record set](#) [→ Move](#) [🗑 Delete zone](#) [🔄 Refresh](#)

Resource group ([change](#))
[rg-dns](#)

Subscription ([change](#))
[MSDN Platforms Subscription](#)

Subscription ID

Tags ([change](#))
[Click here to add tags](#)

Name server 1
ns1-02.azure-dns.com.

Name server 2
ns2-02.azure-dns.net.

Name server 3
ns3-02.azure-dns.org.

Name server 4
ns4-02.azure-dns.info.

DNS Record Sets

- A record set is a collection of records in a zone that have the same name and are the same type
- You can add up to 20 records to any record set
- A record set cannot contain two identical records
- Changing the drop-down Type, changes the information required

Add record set

azureadmininc.org

Name

helloworld

✓

.azureadmininc.org

Type

A

▼

Alias record set ⓘ

☐ Yes ☒ No

TTL *

1

TTL unit

Hours

▼

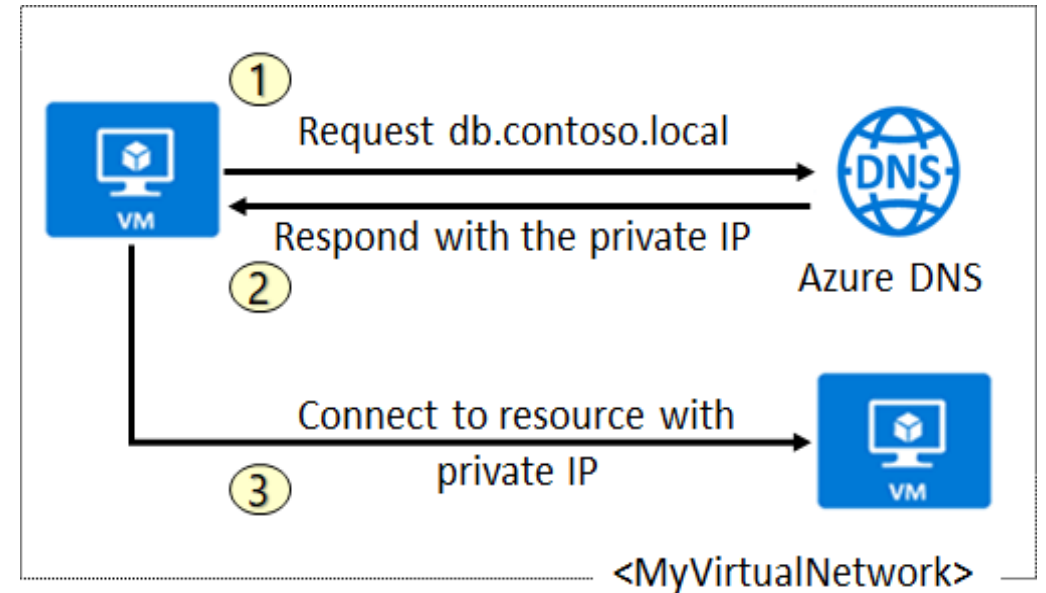
IP address

0.0.0.0

...

DNS for Private Domains

- Use your own custom domain names
- Provides name resolution for VMs within a VNet and between VNets
- Automatic hostname record management
- Removes the need for custom DNS solutions
- Use all common DNS records types
- Available in all Azure regions



Lesson 06: Module 04 Lab and Review



Lab 04 - Implement Virtual Networking

Lab scenario

You plan to create a virtual network in Azure that will host a couple of Azure virtual machines. You will deploy them into different subnets of the virtual network. You also want to ensure that their private and public IP addresses will not change over time. To comply with Contoso security requirements, you need to protect public endpoints of Azure virtual machines accessible from Internet. Finally, you need to implement DNS name resolution for Azure virtual machines both within the virtual network and from Internet.

Objectives

Task 1: Create and configure a virtual network

Task 2: Deploy virtual machines into the virtual network

Task 3: Configure private and public IP addresses of Azure VMs

Task 4: Configure network security groups

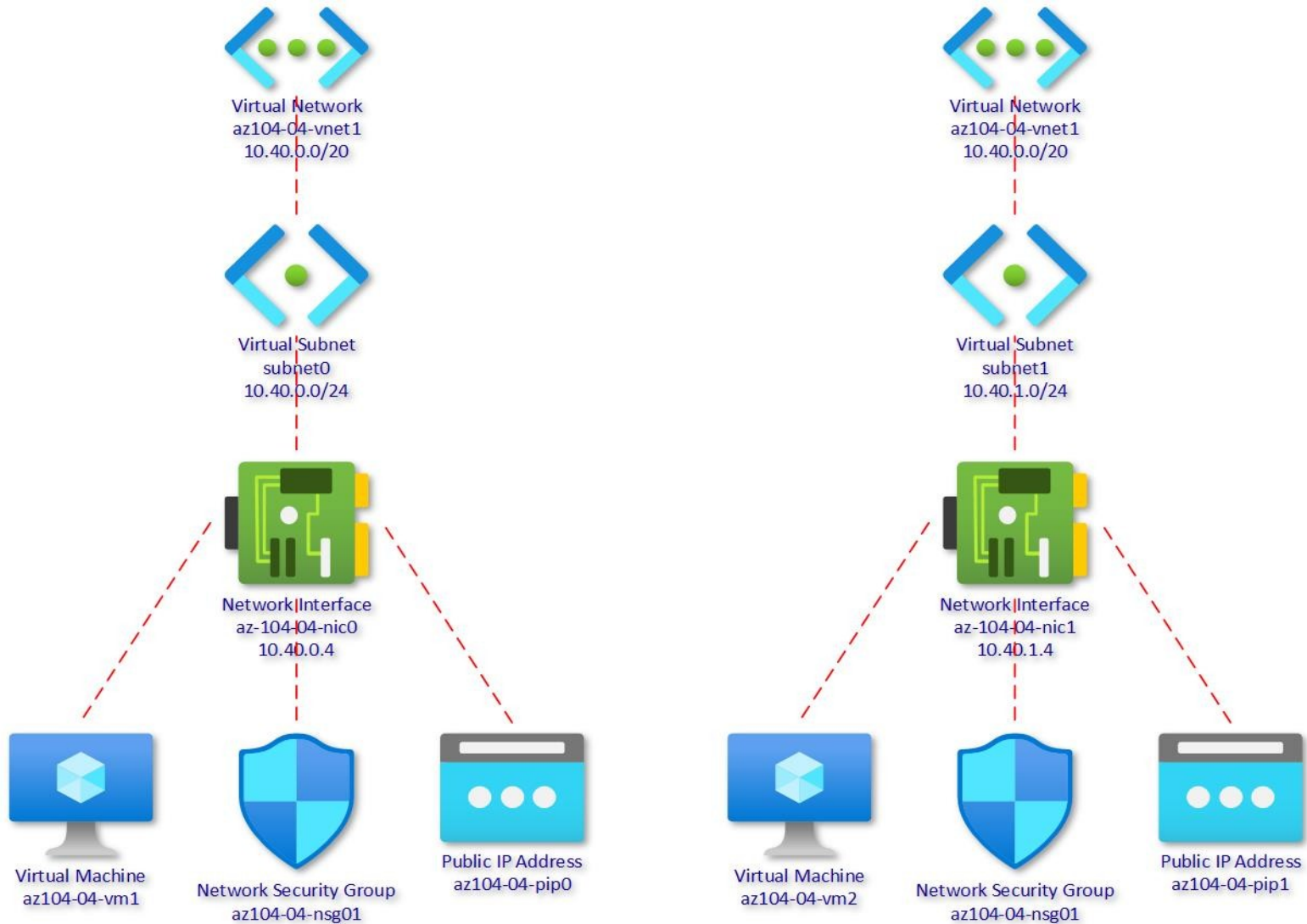
Task 5: Configure Azure DNS for internal name resolution

Task 6: Configure Azure DNS for external name resolution

Next slide for
an architecture diagram



Lab 04 – Architecture Diagram



Module Review

- Module Review Questions
- Microsoft Learn Modules (docs.microsoft.com/Learn)
 - Networking Fundamentals - Principals
 - Design an IP addressing schema for your Azure deployment
 - Secure and isolate access to Azure resources by using network security groups and service endpoints